IFAD
Enabling poor rural people to overcome poverty

Information sheet

WEST AND CENTRAL AFRICA

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Regreening the Sahel: Developing agriculture in the context of climate change in Burkina Faso

The Fourth Assessment Report: Climate Change 2007, issued by the Intergovernmental Panel on Climate Change (IPCC), affirms that warming of the climate system is unequivocal and accelerating. The sectors that are particularly vulnerable to climate change are those on which rural people depend for their livelihoods: agriculture, fishery and forestry.

The already vulnerable Sahel area is highly exposed to climate change impacts due to the strong dependence of its population on rainfed agriculture and livestock. Rainfall variability, land degradation and desertification are some of the key factors that are heavily impacting on local livelihoods. Droughts with varying degrees of severity occur in two out of every five years, making harvests of the major food and cash crops highly uncertain. The recurrent droughts of the 1970s and 1980s caused huge losses of agricultural production and livestock, the loss of human lives to hunger and malnutrition, and the massive displacement of people and shattered economies. Most climate models predict that the Sahel region will become even drier during this century.

In Burkina Faso, weather station observations show that the dry zone has been extending southwards over the last century. Extremes in temperatures are occurring, with monthly high temperature averages now regularly exceeding the previous maximums of 35 degrees Celsius. Severe flooding is also occurring more frequently. Temperatures across Burkina Faso are projected by IPCC to increase 3-4 degrees Celsius by 2080-2099 relative to 1980-1999. The number of extremely dry and wet years will increase during this century, and semi-arid areas will become more arid. There is a high level of uncertainty associated with changes in precipitation in Burkina Faso. However, even increased rainfall is unlikely to reverse the situation since a hotter climate means that evapotranspiration will be more intense, exacerbating the already arid conditions.

Given this situation, adaptation actions are essential. Farmers in the Sahel have been coping with climate variability since the droughts in the early 1970s when they began to modify and enhance traditional land management practices. These practices, commonly known today as soil and water

conservation (SWC) techniques, were introduced on cultivated fields in both Burkina Faso and Niger. They include:

Tassa* or *zaï are improved traditional planting pits, dug on existing farm fields before the onset of the rains, using a hoe to break the surface crust. The pits collect and store water and run-off. Often, organic matter is placed in them to improve soil fertility. Termites are attracted to this organic matter, which they digest, making nutrients more easily available to the plant roots. Termites also dig channels, which increases the soil's water-holding capacity. Various impact assessments have shown that *zaï* planting has a positive impact on grain production and household food security since, in years of good rainfall, many farmers produce surplus grains, which provide a buffer in years of low rainfall. Soil fertility parameters under *zaï* treatment have shown a systematic improvement after three and five years according to some studies, with organic matter content increasing from 1 to 1.4 per cent and nitrogen increasing from 0.05 to 0.8 per cent.

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Zaï

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Half-moons

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Woman from the Ouro village near Ouahigouya, weeding millet planted along a stone *diguette*.

Half-moons (*demi-lunes*) are earth embankments in the shape of a semi-circle with the tips of the bunds on the contour. They are used for growing crops but also for rangeland rehabilitation. Much larger in size than the *tassa*, half-moons also capture run-off water from slightly sloping land and concentrate water and organic matter.

Contour stone bunds and vegetative barriers. Stones are laid out along contour lines on both barren and cultivated lands. The stones slow down and filter run-off, thereby increasing infiltration and capturing sediment. The water and sediment harvested lead directly to improved crop performance, but also to local groundwater recharge, which can increase the water levels in wells. Contour stone bunds can be reinforced with grass strips. Vegetative barriers are cheaper than stone ones and self-maintaining. Suitable grass species can be identified, especially local varieties, i.e. *Andropogon gayanus*. This species is traditionally grown around field boundaries and is used for weaving mats. It is helpful in decreasing both water and wind erosion. Grass can be used in combination with stone bunds, which then can be taken away and reused in different contexts.

Permeable rock dams *(digues filtrantes)*. The structures are typically long, low dams of loose stone constructed in gullies and across valleys. Because they lack a spillway, the dams force flood water to spread over their length, which strongly reduces its erosive force. They also force water to infiltrate: this results in large quantities of sediment being deposited, often filling up gullies within two years – which in turn creates favourable conditions for growing crops where nothing could be grown before.

A range of complementary measures have been taken to optimize the impact of soil and water conservation measures, including the use of compost pits, natural phosphates and agroforestry.

Farmers use manure in the planting pits and half-moons. This manure contains seeds from woody species browsed by livestock. The combination of water and soil fertility also creates favourable conditions for the emergence of woody species. Farmers increasingly protect and manage these species and, by doing so, create new agroforestry systems on what used to be barren land. The density and diversity of species on these rehabilitated lands is often higher than on other fields. The process of on-farm protection and management of trees brings multiple benefits if achieved by growing "useful" trees such as *Faidherbia albida* (which fixes nitrogen that improves soil fertility, and serves as fodder for livestock), *Piliostigma reticulatum* (used for fodder), *Combretum glutinosum* (used for firewood),

Adansonia digitata (whose leaves and fruit offer high-quality nutrition) and *Guiera senegalensis* (used for fodder).

IFAD has provided strong support to the scaling up of these local innovations through its portfolio of investments in Burkina Faso during the past 30 years. Today it can be stated without a doubt that soil and water conservation has brought significant improvements to people's livelihoods and has resulted in a spectacular increase in the number of trees – a phenomenon known today as the "re-greening of the Sahel".

Regreening, or farmer-managed natural regeneration of vegetation, helps farmers to adapt to climate change and it adds organic matter to the soil. Many species are used to produce fodder or are "fertilizer trees". Regreening leads to a stronger integration of agriculture, livestock and forestry by farmers. In Burkina Faso, regreening is found in improved agricultural land and appears in areas with soil and water conservation

Compost pit

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activities, where degraded and completely barren land has been reclaimed and rendered productive. **In the Central Plateau of Burkina Faso, these practices have led to the rehabilitation of from 200,000 to 300,000 hectares of land and the production of an additional 80,000 tons of food per year.**

Benefits of regreening

As a result of the increased integration of trees, crops and livestock, farming systems have become more drought-resilient, more productive and more sustainable. Benefits include:

(i) **Economic** – Specific calculations of farm-level benefits are subject to various methodological and data limitations. However, the large-scale adoption of integrated farming systems suggests that they are highly cost-effective.

(ii) **Improved household food security** – More advanced and productive farming systems are also more resilient to drought. Examples from the neighbouring Niger show that, during the 2005 famine, villages that had invested in agroforestry had little or no infant mortality, because trees could be pruned or cut and sold, which generated some cash with which farmers could buy expensive cereals.

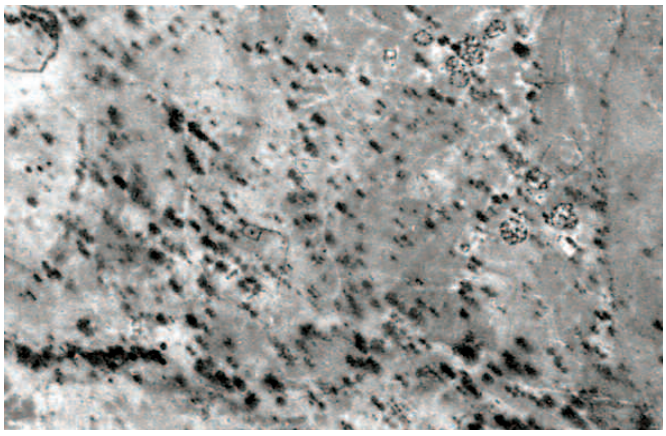
(iii) **Higher crop yields** – In integrated farming systems, crop yields are likely to increase. This is especially true when nitrogen-fixing trees are used, which also results in savings on the costs for inputs/fertilizers. On-farm trees also reduce wind speed and evaporation. In addition, trees are more resistant to drought and rain variability than crops, and in fact contribute to crop survival.

(iv) **Diversification** – Trees produce fruit and leaves with high vitamin content for human consumption. They also produce fodder, which allows farmers to keep more livestock, and to have more manure to fertilize the fields. Trees are also a source of medicinal products and fuel, which households can consume or sell. The more complex and more productive farming system that trees create reduces vulnerability and strengthens the resilience of rural communities to climate-related risks.

(v) **Sahelian women** have gained the most from regreening, as the time spent on firewood collection has decreased from about 2.5 hours a day to 0.5 hours. Women have allocated the time saved to other activities, including producing and preparing food and caring for children.

(vi) In terms of **global environmental benefits**, trees contribute to biodiversity conservation and mitigate climate change through carbon sequestration.

Satellite time-series imagery of Rissiam (Bam Province)



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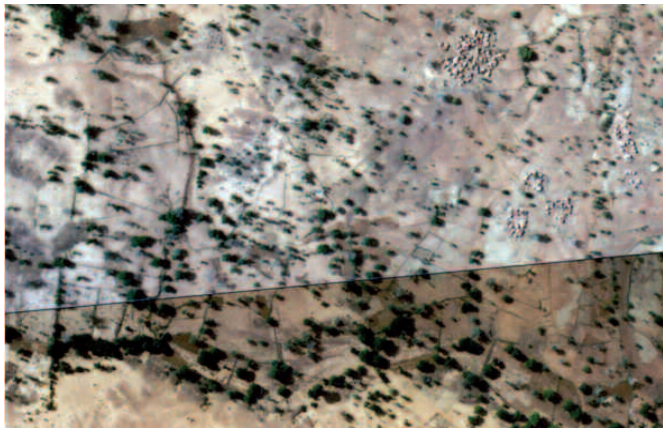

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Photos courtesy of Gray Tappan

IFAD's support to climate adaptation practices in Burkina Faso

In the Sahel region, IFAD has played a precursor role in promoting local technologies and approaches to achieve regreening, including various water and soil conservation technologies and tree regeneration techniques. This experience has extended for over three decades, constituting important support to farmers in adapting to drought and climatic variability. In 2010, the Fund's Executive Board approved IFAD's Climate Change Strategy to ensure a systematic focus on the implications of climate change for its activities at the country level. In 2011, it also approved IFAD's Environment and Natural Resource Management Policy. The policy sets out a thoughtfully articulated enabling environment for integrating agriculture, ecosystem management and climate change adaptation and mitigation at farm, community and landscape scales.

In Burkina Faso, both the **Community Investment Programme for Agricultural Fertility** (PICOFA), started in 2004, and the **Sustainable Rural Development Programme** (SRDP), started in 2006, intervene in areas characterized by increasing drought, erratic rains and land degradation. The programmes are centred on soil fertility management issues and have succeeded in reducing soil erosion and reversing land degradation using indigenous SWC techniques. A major contribution of the two programmes is found in formerly non-agricultural areas, long abandoned because the land there was thought to be "un-reclaimable" (locally these lands are referred to as *zipélé* – barren soils). SWC techniques have proven that the vegetative cover of these lands can be regenerated and the lands can be brought back under cultivation.

The SRDP is combined with a US$2 million grant programme funded by the Global Environment Facility (GEF). The grant programme, initiated in 2010, bases its strategy on Burkina Faso's **Country Partnership Programme for Sustainable Land Management**. It promotes the integration of critical environmental aspects (especially improved management of common resources and degraded lands) into the socio-institutional activities of the rural development programme financed by the SRDP. In addition, it provides added value by promoting the testing and validation of innovative mechanisms for preventing and resolving land tenure conflicts that threaten the management of critical communal natural resources. During the programme's first year of implementation, 1,888 hectares of land were managed with *zaï*, half-moons, stone rows and rock dams; 51,30 hectares of inland valley swamps for rice production were developed; and 25,86 hectares of irrigated vegetable gardens were created.

IFAD is also supporting regreening in other countries in the Sahel (Mali, the Niger and Senegal) through two large grant programmes implemented since beginning of 2011 by the International Centre for Research Agroforestry (ICRAF) and the Centre for International Cooperation, VU University Amsterdam (CIC-VU). In the context of climatic change, farmer-managed natural regeneration has been identified through the experiences of IFAD-funded projects as a principal livelihood support and climate adaptation strategy and therefore as an important innovation for scaling up. Regreening is being supported by ICRAF in terms of technology transfer and by CIC-VU in terms of improved documentation of experience, strengthened analysis, and the creation of broader awareness and policy space for expansion of existing regreening/agroforestry successes in the Sahel. Results of the ICRAF activities so far include about 400 farmers and 20 extension workers trained in anti-erosion techniques and natural regeneration in the parklands. Training also covered the interdependence of trees, crops and livestock, and how to deal with competing and conflicting interests among communities. Practical guidelines for implementation of natural regeneration on anti-erosive sites have also been prepared and disseminated to extension agents. Since little research has been conducted on the costs and benefits of agroforestry in the West African Sahel, a rigorous quantitative and qualitative economic and social impact analysis will be carried out by ICRAF under the contract with CIC-VU across a variety of related activities to substantiate more adequately the different types of benefits of farmer-managed regreening as a major climate adaptation practice. The aim is to provide national and international policymakers with more realistic data about the costs and benefits of on-farm regreening.

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